Date:Feb. 10, 2011

ATD-4344

TENTATIVE

TECHNICAL DATA

VVF32H122G00

CONTENTS

RECORD OF REVISION

Date	The upper section : Before revision The lower section : After revision		Summary
	Sheet No.	Page	

DESCRIPTION

The following specifications are applied to the following TFT open cell.

Product Name : VVF32H122G00

General Specifications

Effective Display Area	: (H)697.685×(V)392.256	(mm)
Number of Pixels	: (H)1,366×(V)768	(pixels)
Pixel Pitch	: (H)0.51075×(V)0.51075	(mm)
Color Pixel Arrangement	: R+G+B Vertical Stripe	
Display Mode	: Transmissive Mode Normally Black Mode	
Top Polarizer Type	: Semi-Glare	
Number of Colors	: 16,777,216	(colors)
External Dimensions	: (H)722.384 x (V)432.956 x (t)(3)	(mm)
Weight	:(T.B.D)	(g)

1. ABSOLUTE MAXIMUM RATINGS

1.1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	℃	1),5),6)
Humidity	2)		2)		%RH	1),6)
Vibration	-	4.9(0.5G)	-	9.8(1.0G)	m/s^2	3),6)
Shock	-	29.4(3G)	-	196(20G)	m/s^2	4),6)
Corrosive Gas	Not Acceptable		Not Acceptable		-	6)

Note 1) Temperature and Humidity should be applied to the glass surface of a TFT module,
not to the system installed with a module.
The temperature at the center of rear surface should be less than 70℃ on the condition of operating.

2) Ta≦40 ℃ · · · · · · Relative humidity should be less than 85%RH max. Dew is prohibited.
Ta＞40 ℃ · · · · · · Relative humidity should be lower than the moisture of the 85%RH at 40℃.

3) Frequency of the vibration is between 15Hz and 100Hz. (Remove the resonance point)

4) Pulse width of the shock is 10 ms.

5) Long operation under low temperature may cause some portion of display area to be reddish for several minutes after turning on the product.
However, it does not affect the characteristics and reliability of the product.

6) Environmental Absolute Maximum Ratings is Based on IPS Alpha Technology TFT standard module.
Leave TFT open cell alone,this environmental ratings can't be guaranteed.The users have a responsibility in considering ability of other parts of TFT module and TFT module process.

1.2 Electrical Absolute Maximum Ratings

Vss = 0 V

ITEM	SYMBOL	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	0	13.2	V	
Input Voltage for logic	V1	-0.3	4.0	V	1)
Electrostatic Durability	VESD0	±100		V	2),3)
	VESD1	±8		kV	2),4)

Note 1)It is applied to pixel data signal and clock signal.
2)Discharge Coefficient：200pF-250Ω, Environmental：25℃-70%RH
3)It is applied to I/F connector pins.
4)It is applied to the surface of a metallic bezel and a LCD panel.

1.3 Environmental Absolute Ratings of TFT open cell

Storage Condition : With shipping package
Storage temperatue range : 25±5 ℃
Storage humidity range : 50±10%RH
Shelf life : a month

2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

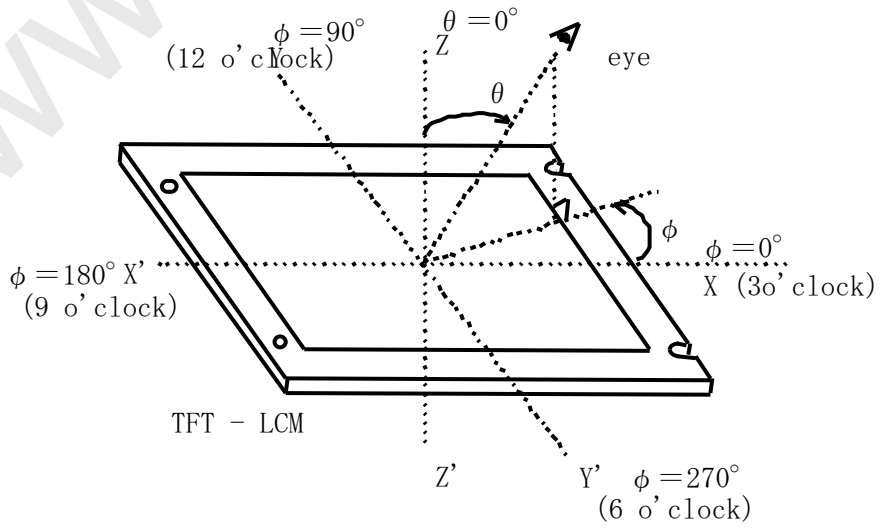
Measuring equipment：CS-1000A, or equivalent

Ambient Temperature =25℃、VDD=12.0V、f V=60Hz、

Light source is backlight of Panasonic Liquid Crystal Display Co.,Ltd. TFT standard module.

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast ratio		CR	θ= 0 ° 1)	800	1400	-	-	2)
Response time	Rise	ton		-	8	20	ms	3)
	Fall	toff		-	6	20	ms	3)
Brightness of white		Bwh		350	450	-	cd/m^2	
Brightness uniformity		Buni		-	-	40	%	4)
Color chromaticity (CIE)	Red	x		0.560	0.590	0.620	-	【Gray scale =255】
		y		0.305	0.335	0.365		
	Green	x		0.310	0.340	0.370		
		y		0.570	0.600	0.630		
	Blue	x		0.125	0.155	0.185		
		y		0.035	0.065	0.095		
	White	x		0.240	0.280	0.320		
		y		0.243	0.283	0.323		
Variation of color position (CIE)	Red	Δx	θ= 50 ° φ= 0 °, 90 °, 180 °, 270 ° 1)	-	-	0.04	-	5) 【Gray scale =255】
		Δy		-	-	0.04		
	Green	Δx		-	-	0.04		
		Δy		-	-	0.04		
	Blue	Δx		-	-	0.04		
		Δy		-	-	0.04		
	White	Δx		-	-	0.04		
		Δy		-	-	0.04		
Contrast ratio at 89 °		CR89	φ=0°,90°, 180°,270° 6)	10	-	-	-	Estimated value

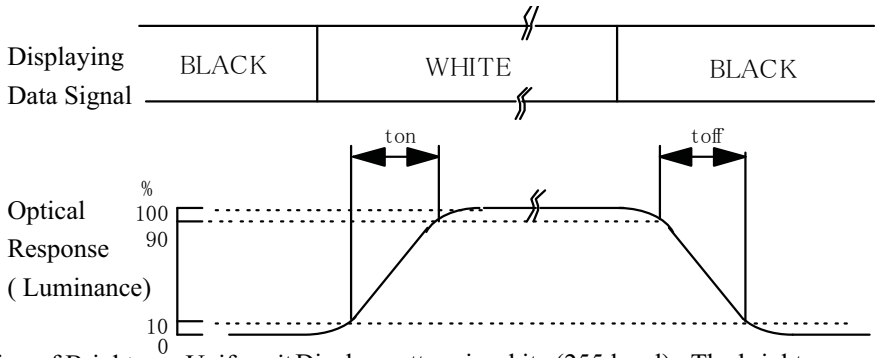
Note 1) Definition of Viewing Angle



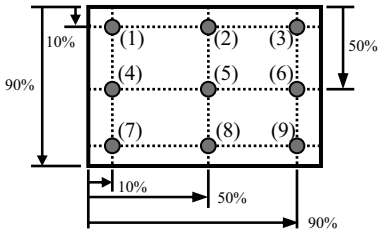
2) Definition of Contrast Ratio (CR)

$$CR = \frac{\text{(Luminance at displaying WHITE)}}{\text{(Luminance at displaying BLACK)}}$$

3) Definition of Response Time



4) Definition of Brightness Uniformit Display pattern is white (255 level) . The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.



● : measuring points

$$Buni = \frac{\left| Bmax \text{ or } Bmin - Bave \right|}{Bave} \times 100$$

where, Bmax = Maximum brightness

Bmin = Minimum brightness

Bave = Average brightness

$$Bave = \frac{\sum_{k=1}^{9} (B(k))}{9}$$

5) Variation of color position on CIE

Variation of color position on CIE is defined as difference between colors at θ=0°and at θ =50°& ϕ =0°90°180°270°.

6)Contrast rasio at 89°

Evaluetion conditions are on horizontal & vertical axis

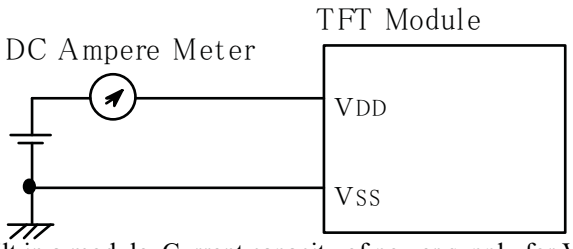
3. ELECTRICAL CHARACTERISTICS

3. 1 TFT-LCD module

Ta=25℃、Vss=0V

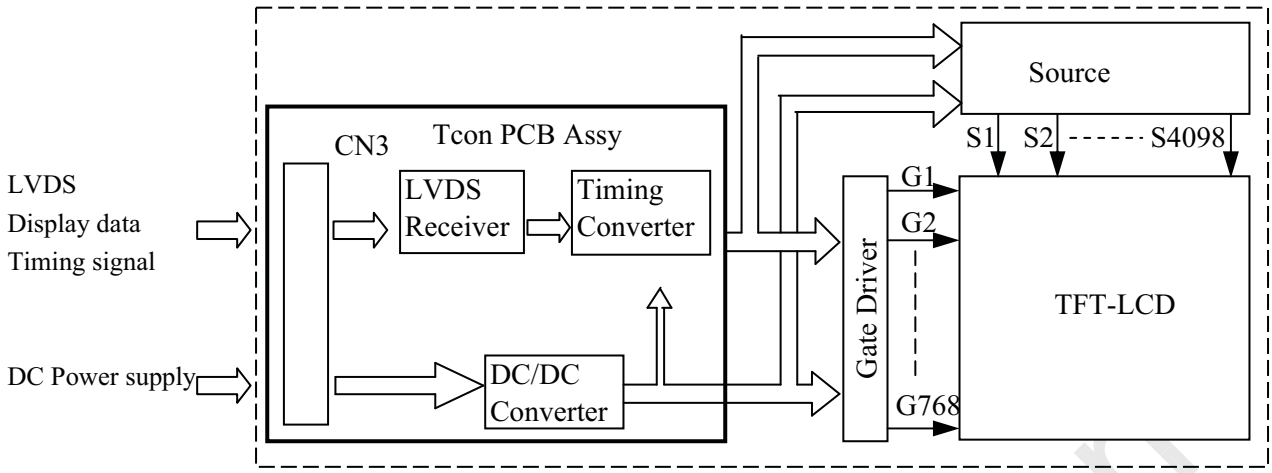
ITEM	SYSTEM	Min.	Typ	Max	単位	備考
Power supply Voltage	VDD	11.4	12.0	12.6	V	
Power supply Current	I DD	-	0.4	0.8	A	1),2)
Ripple voltage of power Supply	VDDR	-	-	350	mV	

Note 1) f_V=60.0Hz, f_{CLK}=85MHz, V_{DD}=12.0V, and display pattern is white raster.



2) Current fuse is built in a module. Current capacity of power supply for VDD for VDD should be larger than 4A, so that the fuse can be opened at the trouble of electrical circuit of module.

4. BLOCK DIAGRAM



5. INTERFACE PIN ASSIGNMENT

5. 1 TFT-LCD MODULE

CN3:JAE FI-X30SSLA-HF

(Matching connector : JAE FI-X30C2L)

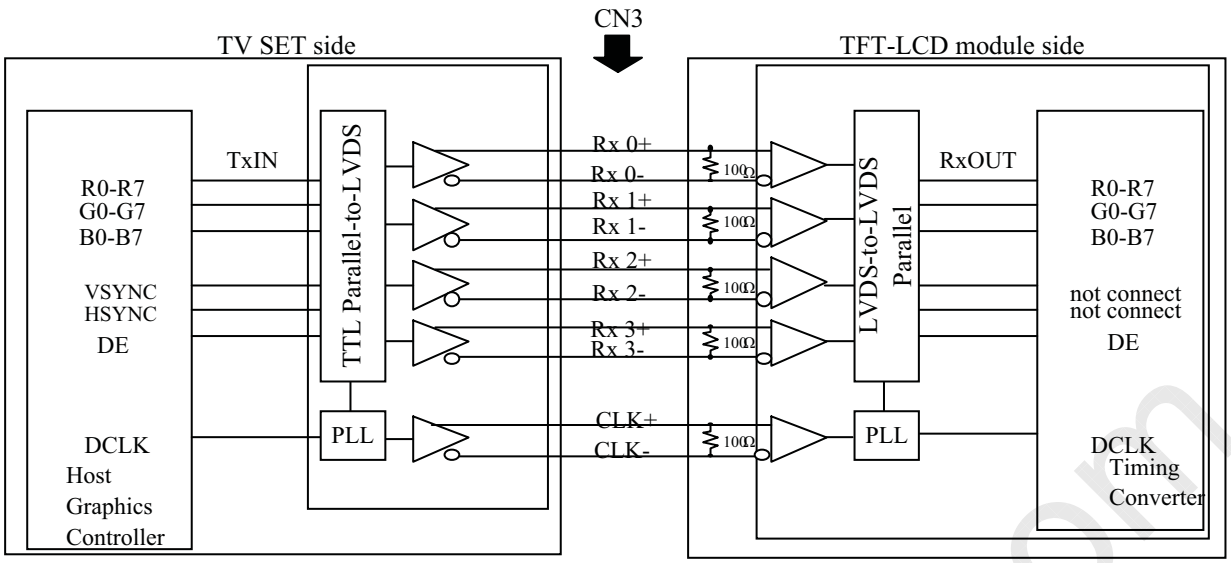
Pin No.	SYMBOL	Description	Note
1	VDD	Power Supply (typ.+12V)	1)
2	VDD		
3	VDD		
4	VDD		
5	VSS	GND(0V)	2)
6	VSS		
7	VSS		
8	VSS		
9	IC	Internally Connected, Keep Open	
10	IC		
11	VSS	GND(0V)	
12	Rx0-	Pixel Data	3)
13	Rx0+		
14	VSS	GND(0V)	2)
15	Rx1-	Pixel Data	3)
16	Rx1+		
17	VSS	GND(0V)	2)
18	Rx2-	Pixel Data	3)
19	Rx2+		
20	VSS	GND(0V)	2)
21	CLK-	Pixel Clock	3)
22	CLK+		
23	VSS	GND(0V)	2)
24	Rx3-	Pixel Data	3)
25	Rx3+		
26	VSS	GND(0V)	2)
27	NC	No Connection	
28	NC	No Connection	
29	VSS	GND(0V)	2)
30	VSS	GND(0V)	2)

Notes 1) All VDD pins shall be connected to +12.0V(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.

3) Rx n+ and Rx n- (n=0,1,2,3) should be wired by twist-pairs or side-by-side FPC patterns, respectively.

5.2 BLOCK DIAGRAM OF INTERFACE



R0～R7	: Pixel R Data	(7; MSB, 0; LSB)
G0～G7	: Pixel G Data	(7; MSB, 0; LSB)
B0～B7	: Pixel B Data	(7; MSB, 0; LSB)
DE	: Data Enable	

Note 1) The system must have the transmitter to drive the module.

2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5.3 LVDS INTERFACE(VESA format)

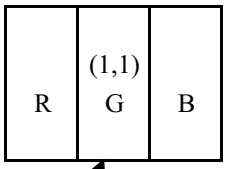
	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR	RECEIVER		TFT CONTROL
		PIN	INPUT		PIN	OUTPUT	INPUT
24bit	R0	51	Tx IN0	Rx 0+	27	Rx OUT0	R0
	R1	52	Tx IN1		29	Rx OUT1	R1
	R2	54	Tx IN2		30	Rx OUT2	R2
	R3	55	Tx IN3		32	Rx OUT3	R3
	R4	56	Tx IN4		33	Rx OUT4	R4
	R5	3	Tx IN6	Rx 0-	35	Rx OUT6	R5
	G0	4	Tx IN7		37	Rx OUT7	G0
	G1	6	Tx IN8	Rx 1+	38	Rx OUT8	G1
	G2	7	Tx IN9		39	Rx OUT9	G2
	G3	11	Tx IN12		43	Rx OUT12	G3
	G4	12	Tx IN13		45	Rx OUT13	G4
	G5	14	Tx IN14		46	Rx OUT14	G5
	B0	15	Tx IN15	Rx 1-	47	Rx OUT15	B0
	B1	19	Tx IN18		51	Rx OUT18	B1
	B2	20	Tx IN19	Rx 2+	53	Rx OUT19	B2
	B3	22	Tx IN20		54	Rx OUT20	B3
	B4	23	Tx IN21		55	Rx OUT21	B4
	B5	24	Tx IN22		1	Rx OUT22	B5
	RSVD 1)	27	Tx IN24		3	Rx OUT24	RSVD 1)
	RSVD 1)	28	Tx IN25	Rx 2-	5	Rx OUT25	RSVD 1)
	DE	30	Tx IN26		6	Rx OUT26	DE
	R6	50	Tx IN27	Rx 3+	7	Rx OUT27	R6
	R7	2	Tx IN5		34	Rx OUT5	R7
	G6	8	Tx IN10		41	Rx OUT10	G6
	G7	10	Tx IN11		42	Rx OUT11	G7
	B6	16	Tx IN16		49	Rx OUT16	B6
	B7	18	Tx IN17	Rx 3-	50	Rx OUT17	B7
	RSVD 1)	25	Tx IN23		2	Rx OUT23	RSVD 1)
	DCLK	31	TxCLK IN	CLK+ CLK-	26	RxCLK OUT	DCLK

R0～R7 : Pixel R Data (7; MSB, 0; LSB)
G0～G7 : Pixel G Data (7; MSB, 0; LSB)
B0～B7 : Pixel B Data (7; MSB, 0; LSB)
DE : Data Enable

Note 1) RSVD (reserved) pins on the transmitter shall be tied to"H"or"L".

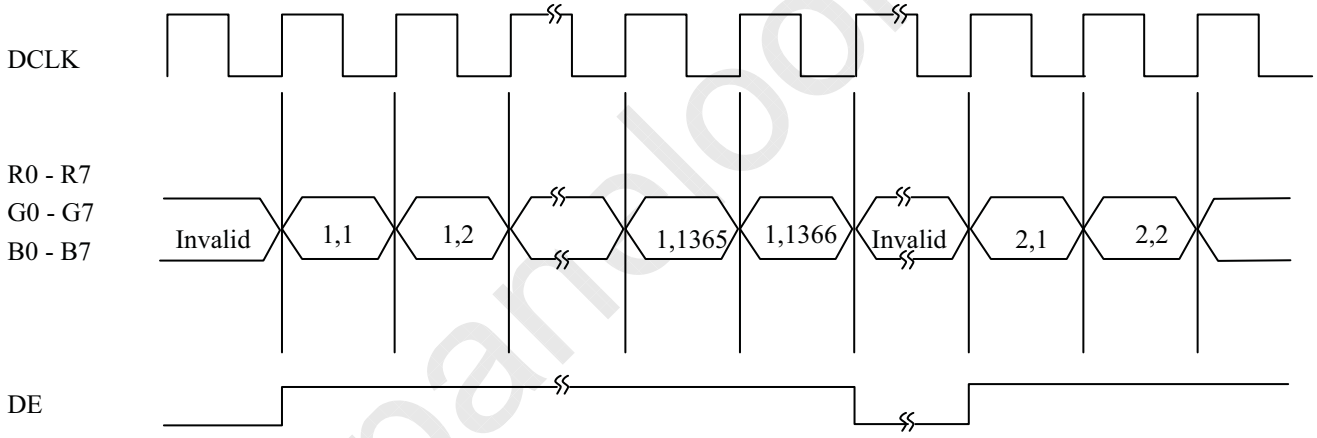
5.4 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE

Display data of adjacent one pixel is latched during one cycle of DCLK.



Pixel : R0 - R7 : R data
G0 - G7 : G data
B0 - B7 : B data

1 , 1	1 , 2	1 , 3	- -	1 , 1366
2 , 1	2 , 2	2 , 3	- -	2 , 1366
3 , 1	3 , 2	3 , 3	- -	3 , 1366
⋮	⋮	⋮		⋮
768 , 1	768 , 2	768 , 3		768 , 1366



5.5 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

Color \ Input		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note 1) Definition of gray scale :

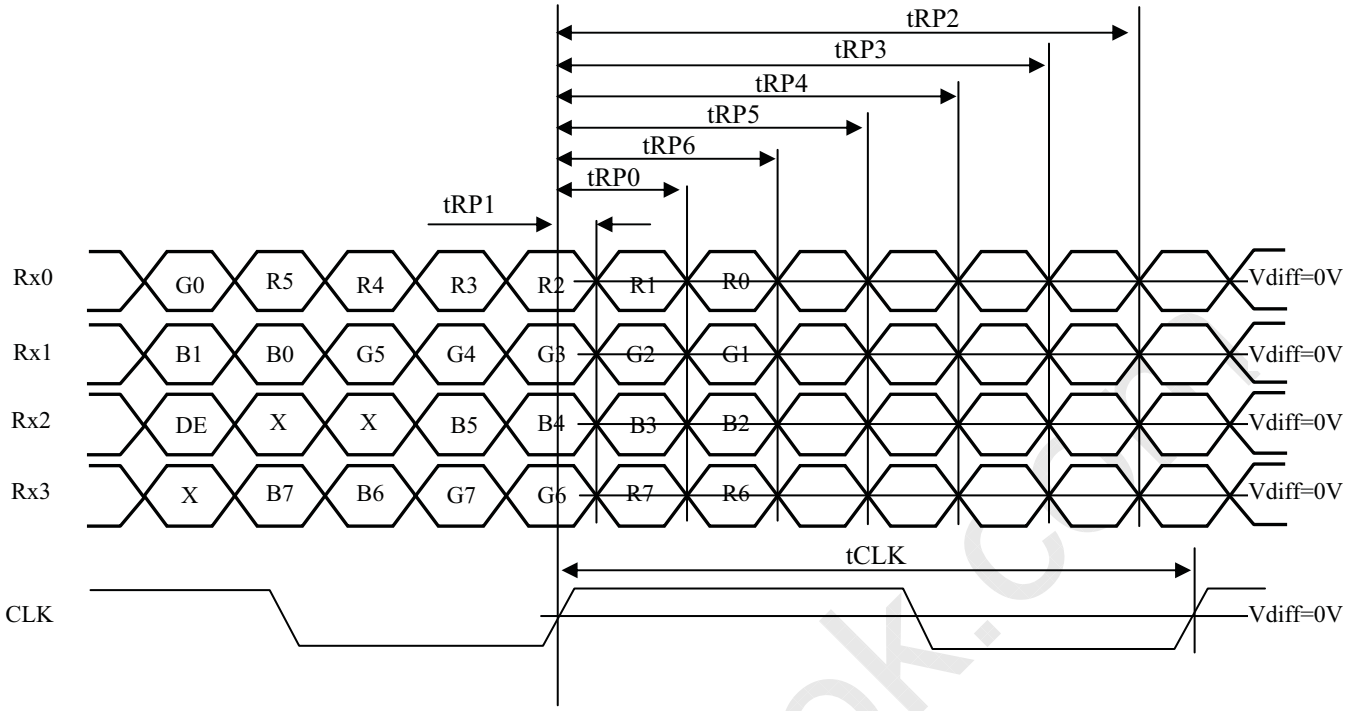
Color(n) · · · ·Number in parenthesis indicates gray scale level.

Larger n correspondsto brighter level.

2) Data : 1 : High, 0 : Low

6. INTERFACE TIMING

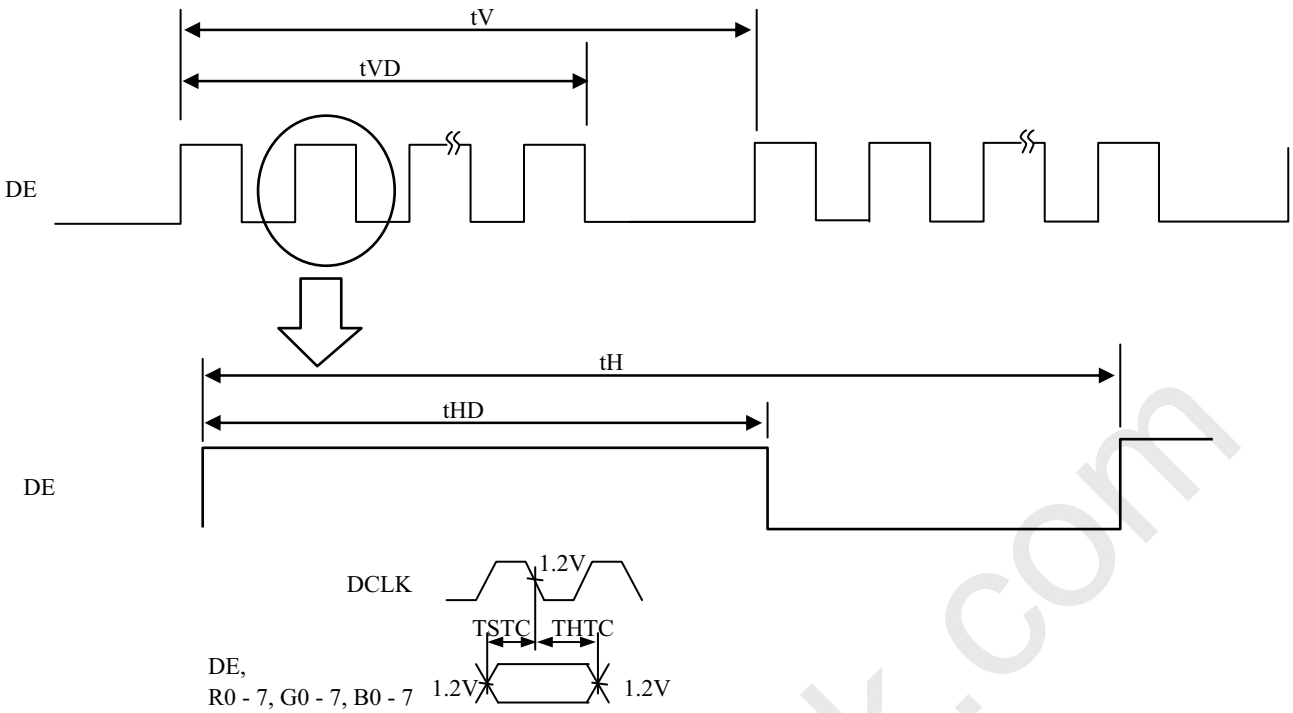
6.1 LVDS receiver timing



Rx0=(Rx0+)-(Rx0-)
Rx1=(Rx1+)-(Rx1-)
Rx2=(Rx2+)-(Rx2-)
Rx3=(Rx3+)-(Rx3-)
CLK=(CLK+)-(CLK-)

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
CLK	Frequency (at 50 Hz)	DCLK	68	78	87	MHz	=1/tCLK
	Frequency (at 60 Hz)		78	85	87	MHz	=1/tCLK
Rx0 Rx1 Rx2 Rx3	0 data position	tRP0	1/7tCLK - 0.4	1/7tCLK	1/7tCLK + 0.4	ns	
	1st data position	tRP1	- 0.4	0	+ 0.4		
	2nd data position	tRP2	6/7tCLK - 0.4	6/7tCLK	6/7tCLK + 0.4		
	3rd data position	tRP3	5/7tCLK - 0.4	5/7tCLK	5/7tCLK + 0.4		
	4th data position	tRP4	4/7tCLK - 0.4	4/7tCLK	4/7tCLK + 0.4		
	5th data position	tRP5	3/7tCLK - 0.4	3/7tCLK	3/7tCLK + 0.4		
	6th data position	tRP6	2/7tCLK - 0.4	2/7tCLK	2/7tCLK + 0.4		

6.2 SYNCRONIZATION SIGNAL TIMING



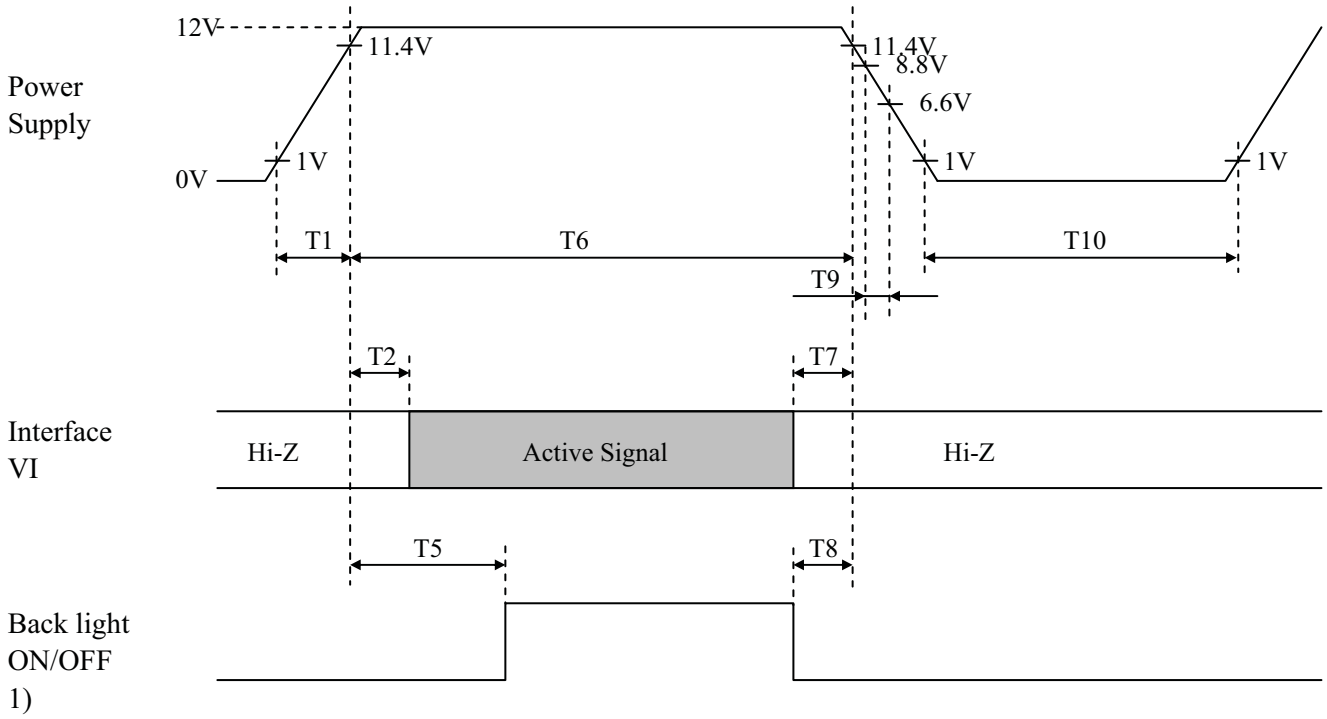
Note 1) Reference level for each timing signal is 1.2 V unless it is stated on the chart, high level voltage(VIH) and low level voltage(VIL) are defined as follows:

VIH ≧ 2.0 V VIL ≦ 0.8 V

2) The timing of DCLK to other signals conforms to the specifications of LVDS transmitter.

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical frequency	fV	46	50 / 60	62	Hz	
	Vertical period	tV	773	860 / 800	1050	tH	
	Vertical valid	tVD		768		tH	
	V-Blanking	-	5	92 / 32	282	tH	
	Horizontal frequency	fH	39.6	43 / 48	49.6	kHz	
	Horizontal period	tH	1400	1814 / 1771	2000	tCLK	
	Horizontal valid	tHD		1366		tCLK	
	H-Blanking	-	34	448 / 405	634	tCLK	

6.3 TIMING BETWEEN INTERFACE SIGNALS POWER SUPPLY



SYMBOL	Min.	Typ.	Max.	UNIT
T1	0	-	10	ms
T2	30	-	-	ms
T3	0	-	T5-150	ms
T5	500	-	-	ms
T6	500	-	-	ms
T7	0	-	-	ms
T8	0	-	-	ms
T9	20	-	-	ms
T10	2	-	-	s

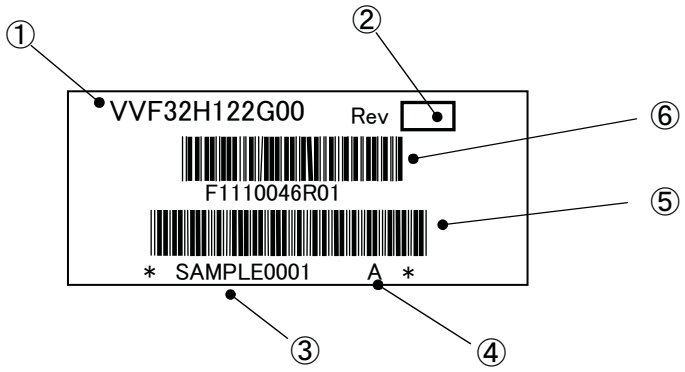
Note 1) In all periods, the backlight ON/OFF signal voltage should be lower than the backlight power supply voltage.

7. DESIGNATION OF LABEL

7.1 Label

The barcode label is pasted on each TFT open cell.

Users use this bar code label to write adjustment Vcom value and Liquid Crystal information to Tcon ROM which is specifi by Panasonic Liquid Crystal Display Co.,Ltd.



Item	Description
①	Product Name
②	Rev. is the column for manifacturing convinience. A-Z except I and O may be written on this column.
③	Lot mark
④	Liquid crystal information Marker A : A, C, E, G, J, L, N, R Marker B : B, D, F, H, K, M, P, S
⑤	Bar code(③+④)
⑥	Bar code(IPSα inner management barcode)

7.2 Record of revision described on the label

Rev.SG = S grade cosmetic specifications

8. COSMETIC SPECIFICATIONS

8.1 Condition for cosmetic inspection

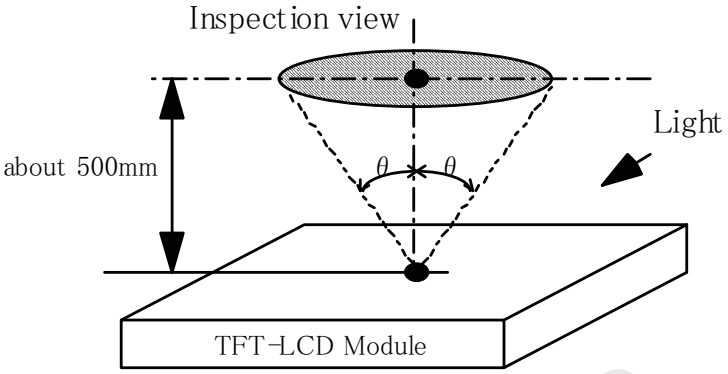
(1) Viewing zone

a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

$\theta \leqq 45^{\circ}$: when non-operating inspection

$\theta \leqq 5^{\circ}$: when operating inspection

b) Inspection should be executed only from front side and only A-zone.
Cosmetic of B-zone and C-zone are ignore.
(refer to 9.2 Definition of zone)



(2) Environmental

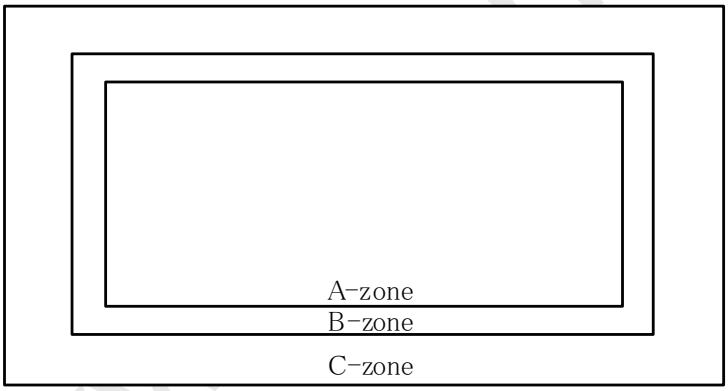
a) Temperature : 25 degrees

b) Ambient light : about 700 lx and non-directive when operating inspection.
: about 1000 lx and non-directive when non-operating inspection.

c) Back-light : when non-operating inspection, back-light should be off .

8.2 Definition of zone

・A-zone : Display area (pixel area)
・B-zone : Area between A-zone and C-zone
・C-zone : Metallic bezel area



8.3 COSMETIC SPECIFICATIONS

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

	No	ITEM			Max. acceptable number A-zone S grade	Max. acceptable number A-zone A grade	Unit	Note
Operating inspection	1	Dot defect	Sparkle mode	1-dot	0	2	pcs	1),2),4)
				2-dots	0	0	Units	1),2),5)
				3-dots	0	0		
				Density	0	2	pcs/ ϕ 20mm	1),2),6)
				Total	0	2	pcs	1),2)
			Black mode	1-dot	5	7	pcs	1),3),4)
				2-dots	1	1	Units	1),3),5)
				3-dots	0	0		
				Density	3	4	pcs/ ϕ 20mm	1),3),6)
				Total	5	7	pcs	1),3)
				Total	5	7	pcs	1)
	2	Line defect			Serious one is not allowed		-	-
	3	Uneven brightness						
	4	Stain inclusion (Line shape W : width (mm) L : length (mm))	W≦0.02	L : Ignore	Ignore		pcs	7)
			W≦0.04	L≦4.0	8			
				L>4.0	0			
			W≦0.08	L≦2.0	8			
				L>2.0	0			
			W>0.08	-	(See dot shape)			
	5	Stain inclusion (Dot shape D : ave. dia (mm))	D≦0.22		Ignore		pcs	7)
			D≦0.5		8			
			D>0.5		0			
	6	Scratch on polarizer (Line shape W : width (mm) L : length (mm))	W≦0.02	L : Ignore	Ignore		pcs	8)
			W≦0.08	L≦20	10			
				L>20	0			
			W>0.08	-	0			
	7	Scratch on polarizer (Dot shape D : ave. dia (mm))	D≦0.2		Ignore		pcs	8)
			D≦0.6		10			
			D>0.6		0			
	8	Bubbles, peeling in polarizer (D : ave. dia (mm))	D≦0.2		Ignore		pcs	8)
			D≦0.5		10			
			D>0.5		0			
	9	Wrinkles on polarizer			Serious one is not allowed.		-	-

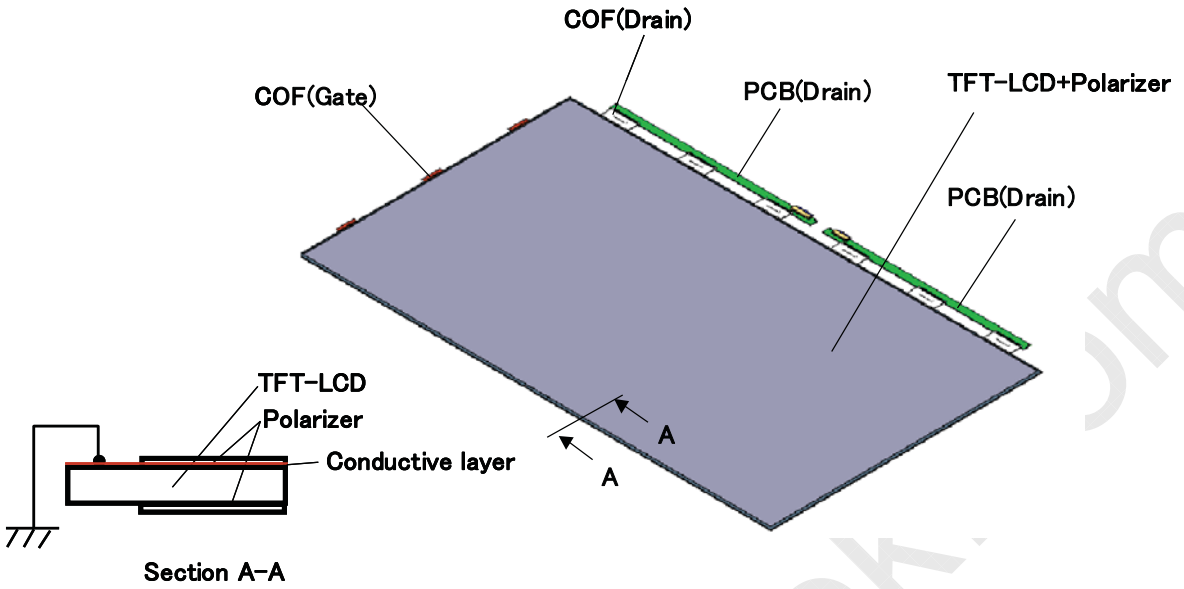
Note 1) Dot defect : defect area > 1/2 dot
2) Sparkle mode : brightness of dot is more than 30% at black. (visible to eye)
3) Black mode : brightness of dot is less than 70% of L255 brightness.
4) 1 dot : defect dot is isolated, not attached to other defect dot.
5) N dots : N defect dots are consecutive. (N means the number of defects dots)
6) Density : number of defect dots inside 20mm ϕ .
7) Those stains which can be wiped out easily are acceptable.
8) Polarizer area inside of B-zone is not applied.
9) No major (serious) defects when viewed in gray scale mode.

9. PRECAUTION

Please pay attention to the followings when a TFT open cell is used, handled and mounted.

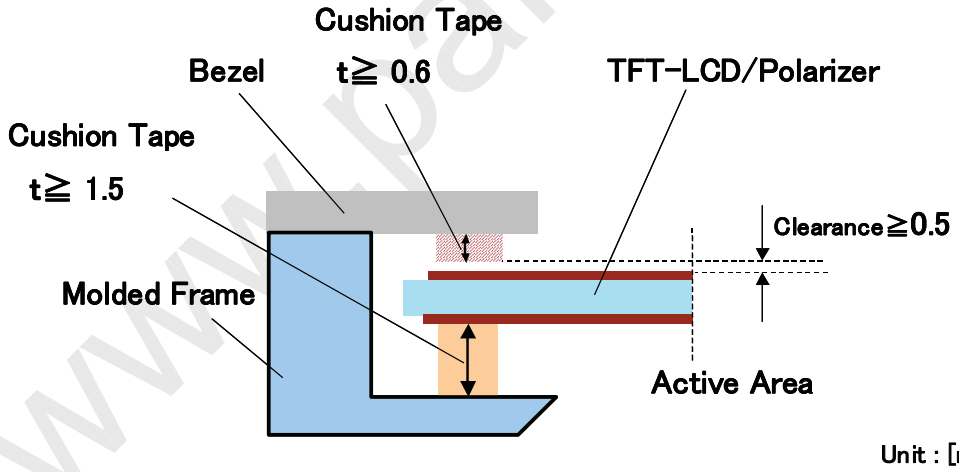
9.1 Recommendation of GND connection of TFT open cell

(1) Please connect LCD surface (front side) to GND for prevention of static charge.



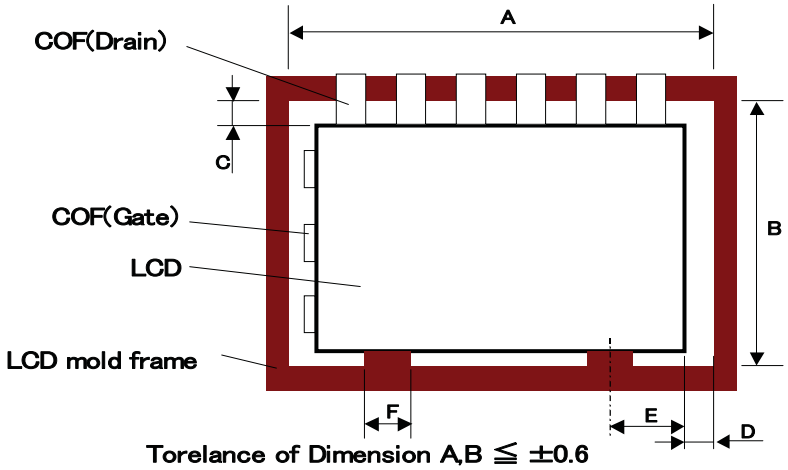
9.2 Recommendation of structure for supporting TFT-LCD Rim

(1) When the LCD is applied by stress, it occurs abnormal image quality.
(It is confirmed visually especially in case of gray raster.)
The system shown on the drawing down below is recommended to maintain the LCD by cutting down the LCD stress.



Unit : [mm]

(2)The dimension of mold frame and LCD is reccomended as follows.



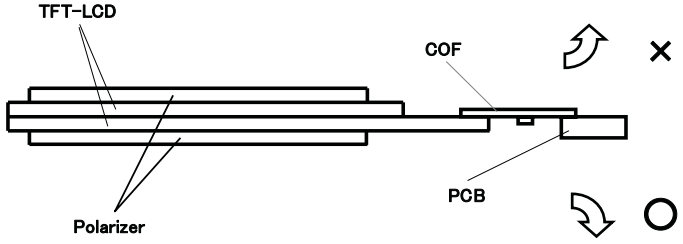
Torelance of Dimension A,B ≦ ±0.6
C = 0.8, D = 0.6
F=50～70(32")　　E=120～130(32")
F=70～90(37")　　E=145～155(37")

Unit : [mm]

(3)The wall of the mold frame should be laid on whole sides of the LCD as much as possible.
(4)The holding space for the LCD should be maintained by the mold frame and the bezel.
(5)Screw the mold frame to the lower frame at many places to keep flatness of LCD support area.
(6)The mold frame should be the structure that is divided into four sides to keep flatness of LCD support area.
(7)LCD support surface at lower side should smooth to cutting down the LCD stress.
(Put PET tape between LCD and support area, etc.)
(8)At the time of ground connection, take a method that does not put a load to the LCD.
(9)Use silicon rubber with hardness 20 for cushion to the mold frame side.
(10)Use foaming cushion to Bezel side.
(11)Flatness of the Bezel should be 0.5 which also should be the shape does not have partial changing points.
(12)The bezel should be the structure that is divided into four sides and screwed from the upper side.
(13)The surface of the cushion (the surface which attaches to the LCD) should be mat finishing or should put PET tape to avoid the LCD and the cushion from sticking together.

9.3 Precaution to handling and mounting

(1)The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand,greasy clothed or dusty clothes.
(2) The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-hexane or Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a TFT cell. Other cleaning chemicals such as acetone, toluen and alcohol should not be used to clean adhesives because they cause chemical damage to a polarizer.
(3)Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer and electronic parts may be deformed.
(4)Applying upward bend to COF may cause a malfunction electrically and mechanically.



(5)Applying too much force and stress to PCB and COF may cause a malfunction electrically and mechanically.

9.4 Precaution to operation

(1) The ambient temperature near the operated cell and electronic parts should be satisfied with the ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.

(2) The spike noise causes the mis-operation of a TFT open cell. The level of spike noise should be as follows:
-200mV<=over- and under- shoot of VDD<= +200mV
VDD including over- and under- shoot should be satisfied with the absolute maximum ratings.

(3) Optical response time, luminance and chromaticity depend on the temperature of a TFT open cell.

(4) Sudden temperature change may cause dew on and/or in the a TFT open cell. Dew males damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.

(5) Fixed patterns displayed on a TFT open cell for a long time may cause after-image. It will be recovered soon.

(6) The TFT open cell has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.

(7) Noise may be heard when a back-light is operated. If necessary, sufficient suppression should be done by system manufacturers.

(8) Inserting or pulling I/F connectors causes any trouble when power supply and signal dates are on-state.I/F connectors should be inserted and pulled after power supply and signal dates are turned off.

9.5 Electrostatic discharge control

(1) Since a TFT open cell consists of a TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a TFT open cell should be grounded through adequate methods such as a list band. Connector pins should not be touched directly with bare hands.

(2) Protection film for a polarizer on a TFT open cell should be slowly peeled off so that the electrostatic charge can be minimized.

9.6 Precaution to strong light exposure

(1) The TFT open cell should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a TFT open cell may be degraded.

9.7 Precaution to storage

When TFT open cells for replacement are stored for a long time, following precautions should be taken care of:

(1) TFT open cells should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. TFT open cells should be stored at 0 to 35℃ at normal humidity (60%RH or less).

(2) The surface of polarizers should not come in contact with any other object. It is recommended that TFT open cells should be stored in the IPS Alpha Technology's shipping box.

9.8 Reliability

Since electronic components are implemented to this LCD, if water drops are adhered, it causes trouble. So, be careful of water drops adherence. (Especially around the driver circuit and the source PCB) If any problems or damages caused by water drops, etc. by any chance, these are not covered under warranty.

9.9 Precaution to handling protection film

(1) The protection film for polarizers should be pealed off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.

(2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.

(3) The TFT open cell with protection film should be stored on the conditions explained in 10.7 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a TFT open cell is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.

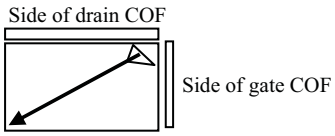
(4) The adhesive can be removed easily with Normal-Hexane. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane.

(5) The procedure of peeling protection film on pokarizer is recommended as follows.

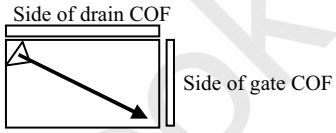
(5-1)Set up LCD on the rest of the cell as the lower polarizer film comes on top gently.

(5-2)Peel off protection film from lower polarizer film with tape.

The protection film should be peeled as Drawing 1 or 2.



Drawing 1



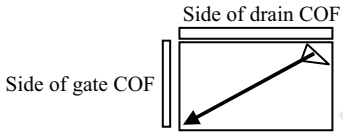
Drawing 2

(5-3)Set up LCD on the Backlight unit as the upper polarizer film comes on top gently.

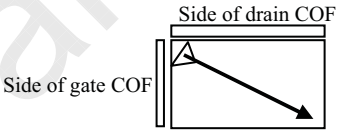
(5-4)Connect LCD surface to GND.

(5-5)Peel off protection film from upper polarizer film with tape.

The protection film should be peeled as Drawing 3 or 4.



Drawing 3



Drawing 4

9.10 Safety

(1) Since a TFT cell is made of glass, handling to the broken TFT open cell should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken TFT open cell should be washed sufficiently.

9.11 Environmental protection

(1) Flexible printed circuits and printed circuits board contain small amount of lead.
Please follow local ordinance or regulations for its disposal.

9.12 Use restrictions and limitations

(1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.

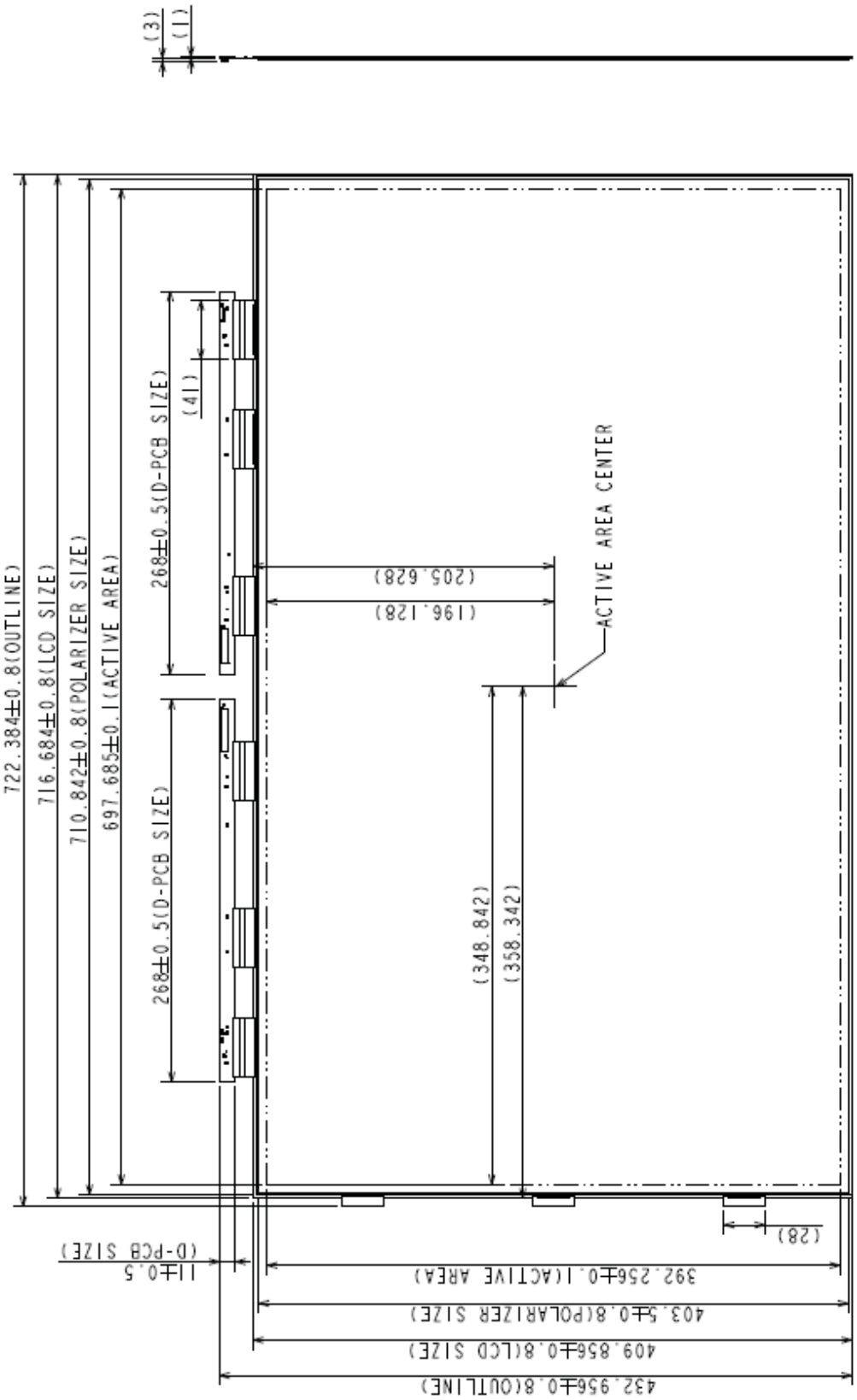
(2) In no event shall IPS Alpha Technology, Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contact, breach of warranty, negligence, strict liability, misrepresentation and other torts.

9.13 Others

(1) Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.

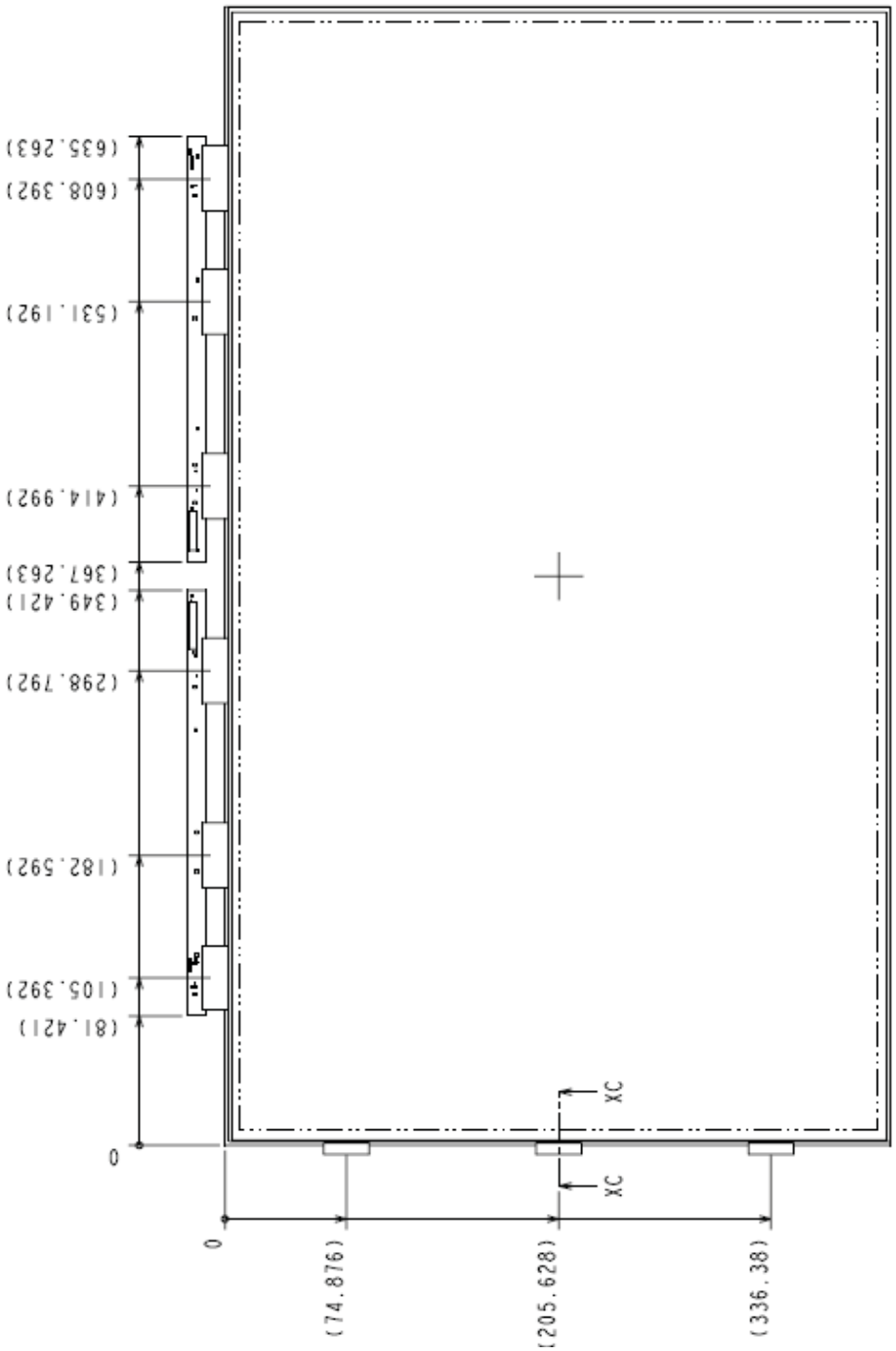
10. Dimensional Out Line

Front View 1



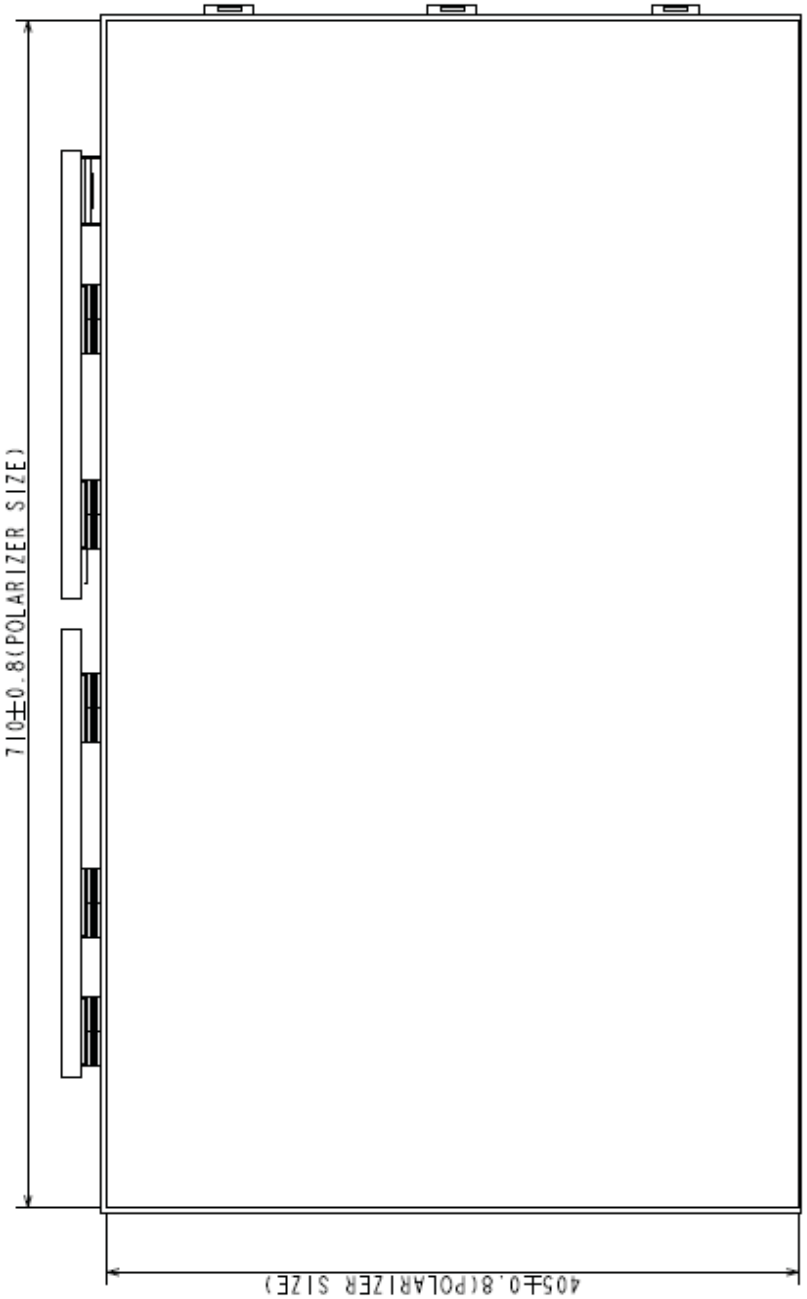
Panasonic Liquid Crystal Display Co.,Ltd.	Date	Feb.10.2011	Sheet No.	IPS4PS 2613 VVF32H122G00-1	Page	13-1/3

Front View 2



Panasonic Liquid Crystal Display Co.,Ltd.	Date	Feb.10.2011	Sheet No.	IPS4PS 2613 VVF32H122G00-1	Page	13-2/3

Back View



Panasonic Liquid Crystal Display Co.,Ltd.	Date	Feb.10.2011	Sheet No.	IPS4PS 2613 VVF32H122G00-1	Page	13-3/3